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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/023,940	12/21/2001	Jin-goo Park	1751-297	7717
6449	7590	10/05/2004	EXAMINER KORNAKOV, MICHAEL	
ROTHWELL, FIGG, ERNST & MANBECK, P.C. 1425 K STREET, N.W. SUITE 800 WASHINGTON, DC 20005			ART UNIT 1746	PAPER NUMBER

DATE MAILED: 10/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/023,940

Applicant(s)

PARK ET AL.

Examiner

Michael Kornakov

Art Unit

1746

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) 1 and 2 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4 is/are allowed.
- 6) ☒ Claim(s) 3 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☒ Claim(s) 1-4 are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

1. The objection to the disclosure is withdrawn in view of Applicants' amendment to the specification, dated 7/23/04.

2. The rejections of claims 3 and 4 under U.S.C. 112, first and second paragraphs are withdrawn in view of Applicants' remarks, dated 7/23/04.

3. Claims 1-4 are pending in the application. Claims 1 and 2 were previously withdrawn from consideration. Claims 3 and 4 are examined on the merits.

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fukazawa (U.S. 6,423,146) in view of Shibano (U.S. 5,383,483).

Fukazawa teaches a method for cleaning a surface of semiconductor substrate including the steps of forming a cleaning solution from ozone and ammonium hydroxide, supplying the said cleaning solution to processing chamber and processing the surface of semiconductor substrate with said cleaning solution, wherein the processing is enhanced by radiating the substrate with high frequency waves of approximately 1MHz. The concentration of ammonium hydroxide solution of Fukazawa is set to fall within the range of 0.1-5% by weight, which corresponds to the instantly claimed concentration of aqueous ammonium hydroxide. The ammonium hydroxide solution of Fukazawa is further diluted by ozone water such that the volume ration of the ozone water to the ammonium hydroxide reaches 100:1 (Abstract; col. 2, lines 5-10; col.3, lines 25-35, 42-50; col.6, lines 48-56).

With regard to the limitation, specifying "a room temperature", since the processing temperature in Fukazawa is not specifically elucidated, one skilled in the art would have found obvious to clean the substrate at room temperature in order to simplify the processing equipment and avoid additional processing steps, utilizing the cleaning technique of Fukazawa with the reasonable expectation of success.

It is also noticed here, that the cleaning temperature is result effective, because it affects the concentration of ozone in cleaning solution, thus affecting the substrate processing time. However, discovery of optimum value of result effective variable in known process is ordinarily within the skill in the art and would have been obvious, consult *In re* Boesch and Slaney 205 USPQ 215 (CCPA 1980).

The teaching of Fukazawa remains silent about supplying the cleaning solution into a cleaning bath through a filter for removing ozone bubble. However, such degasifying filters or membranes are conventionally utilized in the art, wherein ultrasonic cleaning is involved. For example, Shibano teaches the ultrasonic cleaning of a workpiece and indicates that "the workpiece can be cleaned more effectively as a smaller amount of gas is contained in the cleaning fluid used." (col.1, lines 25-27). Shibano also states that when the ultrasonic energy is radiated into the cleaning solution by the ultrasonic radiation means, the cleaning solution is cavitated and the smoothly developed cavitation in the cleaning solution, which is well filtered is effective to clean the workpiece efficiently (col.2, lines 24-27; col.6, lines 66-68). Thus, Shibano clearly motivates the skilled in the art to minimize the amount of gaseous media in the cleaning liquid during ultrasonic processing in order to enhance cleaning process. In

Art Unit: 1746

order to minimize the presence of gaseous media in cleaning solution Shibano utilizes gas separating membranes (paragraph, bridging col.1 and 2). Therefore, one skilled in the art motivated by the teaching of Shibano at the time the invention was made would have found obvious to degasify the cleaning solution, utilizing appropriate membrane or filter in order to minimize the presence of gaseous bubbles in the cleaning solution of Fukazawa, thus enhancing the effectiveness of substrate ultrasonic cleaning in the method of Fukazawa with the reasonable expectation of success.

Allowable Subject Matter

6. Claim 4 is allowable over the prior art of recorded.
7. The following is an examiner's statement of reasons for allowance: Neither the combined teaching of Fukazawa/Shibano nor the other prior art of record suggest fairly or anticipate the combination of processing steps as instantly recited, including the step of dipping a wafer surface in aqueous cleaning solution of ozone and ammonium hydroxide of recited concentration, wherein the aqueous cleaning solution is at a temperature range of 10-15°C and is circulated through a chiller.

Response to Arguments

8. Applicant's arguments with respect to claims 3 and 4 have been considered but are moot in view of the new ground(s) of rejection.

Art Unit: 1746

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Barr can be reached on (571) 272-1414. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

M. Kornakov

Michael Kornakov
Primary Examiner
Art Unit 1746

09/30/2004